DATA SHEET

NEC

# MOS FIELD EFFECT TRANSISTOR

# μPA1757

## SWITCHING
## N-CHANNEL POWER MOS FET
## INDUSTRIAL USE



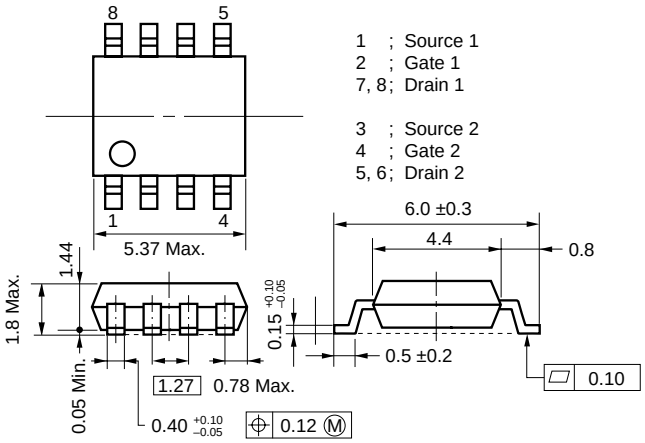
### Description

This product is Dual N-Channel MOS Field Effect Transistor designed for power management application of notebook computers, and Li-ion battery application.

### Features

- Dual MOS FET chips in small package
- 2.5 V gate drive type and low on-resistance
  $R_{DS(on)1}$ = 23 mΩ (MAX.) ($V_{GS}$ = 4.5 V, $I_D$ = 3.5 A)
  $R_{DS(on)2}$ = 32 mΩ (MAX.) ($V_{GS}$ = 2.5 V, $I_D$ = 3.5 A)
- Low $C_{iss}$ $C_{iss}$ = 750 pF Typ.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

### Package Drawing (Unit : mm)

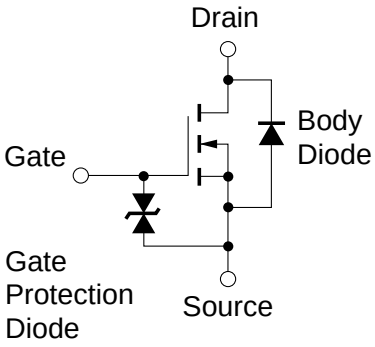



### Ordering information

| Part Number | Package |
|---|---|
| μPA1757G | Power SOP8 |

### Absolute Maximum Ratings ($T_A$ = 25 °C)

| | | | |
|---|---|---|---|
| Drain to source voltage | $V_{DSS}$ | 20 | V |
| Gate to source voltage | $V_{GSS}$ | ±12.0 | V |
| Drain current (DC) | $I_{D(DC)}$ | ±7.0 | A |
| Drain current (pulse)[Note1] | $I_{D(pulse)}$ | ±28 | A |
| Total power dissipation (1 unit)[Note2] | $P_T$ | 1.7 | W |
| Total power dissipation (2 unit)[Note2] | $P_T$ | 2.0 | W |
| Channel temperature | $T_{ch}$ | 150 | °C |
| Storage temperature | $T_{stg}$ | –55 to +150 | °C |




**Notes 1.** PW ≤ 10 μs, Duty Cycle ≤ 1 %

**2.** $T_A$ = 25 °C, Mounted on ceramic substrate of 2000 $mm^2$ x 1.1 mm

The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

**The information in this document is subject to change without notice.**

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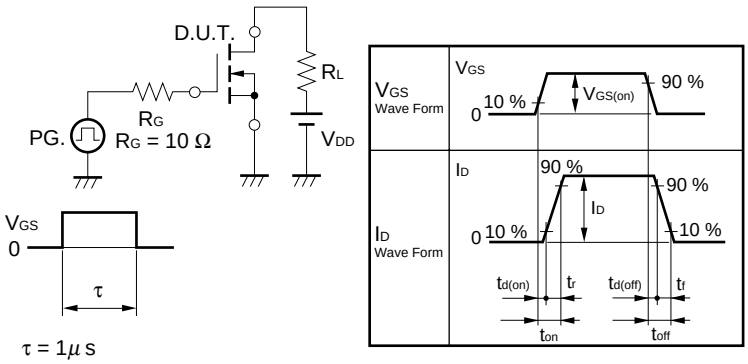
## Electrical Characteristics ($T_A$ = 25 °C)

| Characteristics | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Drain to source on-state resistance | $R_{DS(on)1}$ | $V_{GS}$ = 4.5 V, $I_D$ = 3.5 A | | 16.2 | 23 | mΩ |
| | $R_{DS(on)2}$ | $V_{GS}$ = 2.5 V, $I_D$ = 3.5 A | | 22 | 32 | mΩ |
| Gate to source cutoff voltage | $V_{GS(off)}$ | $V_{DS}$ = 10 V, $I_D$ = 1.0 mA | 0.5 | 0.8 | 1.5 | V |
| Forward transfer admittance | $\|y_{fs}\|$ | $V_{DS}$ = 10 V, $I_D$ = 3.5 A | 5.0 | 13 | | S |
| Drain leakage current | $I_{DSS}$ | $V_{DS}$ = 20 V, $V_{GS}$ = 0 V | | | 10 | μA |
| Gate to source leakage current | $I_{GSS}$ | $V_{GS}$ = ±12.0 V, $V_{DS}$ = 0 V | | | ±10 | μA |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 10 V<br>$V_{GS}$ = 0 V<br>f = 1 MHz | | 750 | | pF |
| Output capacitance | $C_{oss}$ | | | 420 | | pF |
| Reverse transfer capacitance | $C_{rss}$ | | | 140 | | pF |
| Turn-on delay time | $t_{d(on)}$ | $I_D$ = 3.5 A<br>$V_{GS(on)}$ = 4.0 V<br>$V_{DD}$ = 10 V<br>$R_G$ = 10 Ω | | 57 | | ns |
| Rise time | $t_r$ | | | 206 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | 593 | | ns |
| Fall time | $t_f$ | | | 815 | | ns |
| Total gate charge | $Q_G$ | $I_D$ = 7.0 A<br>$V_{DD}$ = 16 V<br>$V_{GS}$ = 4.0 V | | 13.0 | | nC |
| Gate to source charge | $Q_{GS}$ | | | 2.6 | | nC |
| Gate to drain charge | $Q_{GD}$ | | | 5.3 | | nC |
| Body diode forward voltage | $V_{F(S-D)}$ | $I_F$ = 7.0 A, $V_{GS}$ = 0 V | | 0.75 | | V |

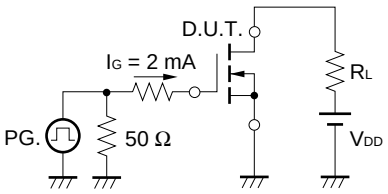


Test circuit 1 Switching time



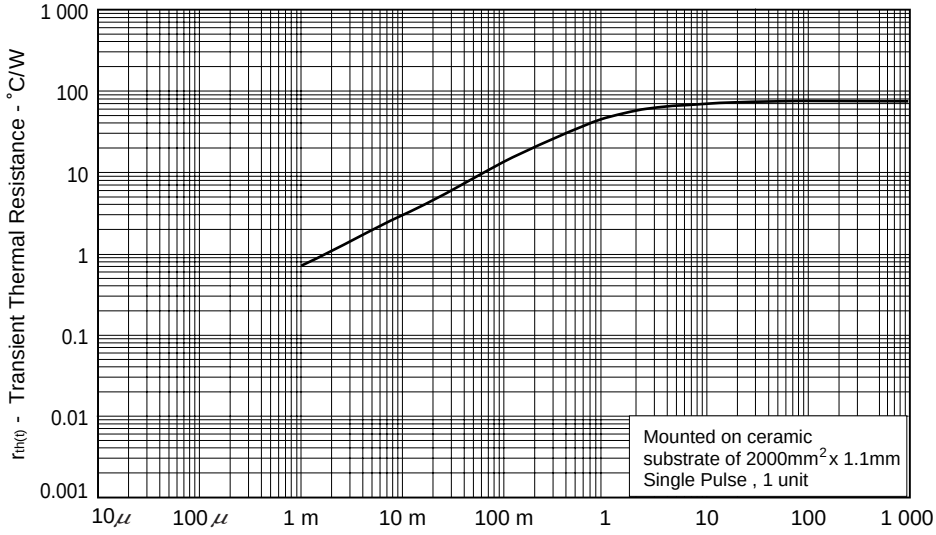

τ = 1μs
Duty Cycle ≤ 1 %

Test circuit 2 Gate charge



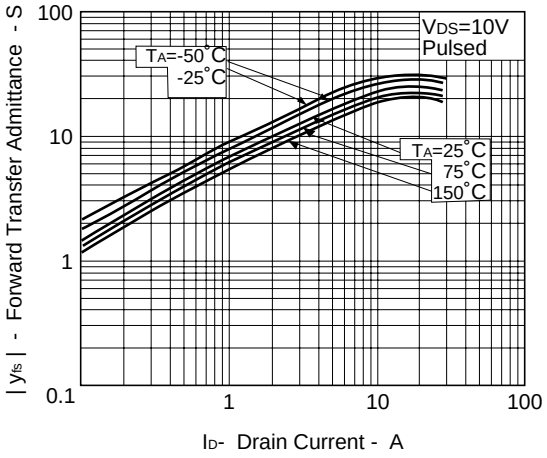
## Typical Characteristics ($T_A$ = 25 °C)

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

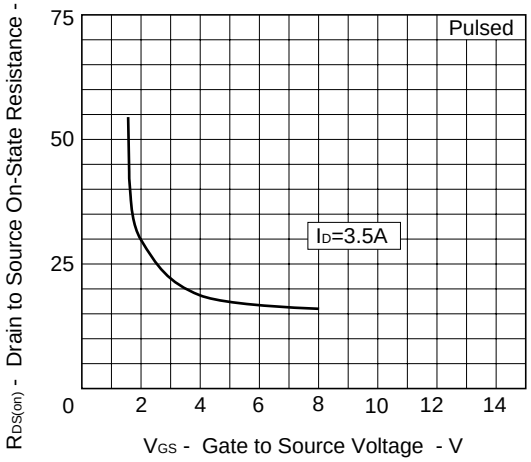




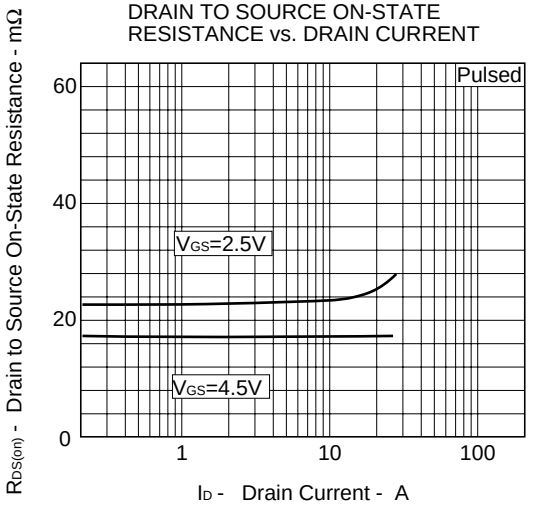

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



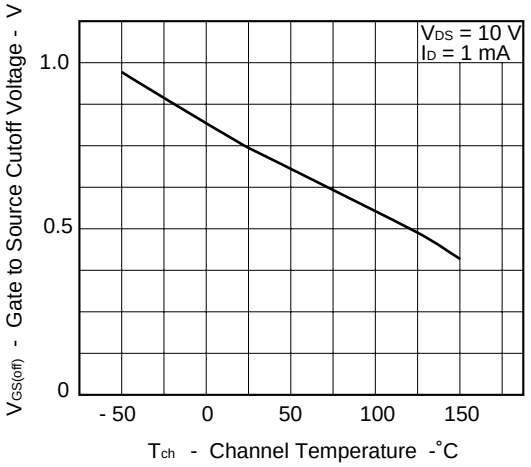

DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



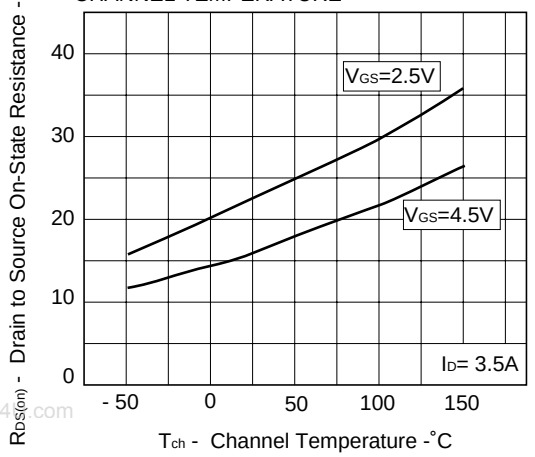

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT




GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE

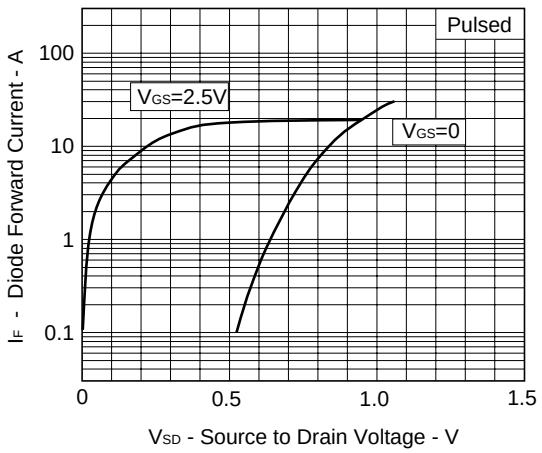


DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

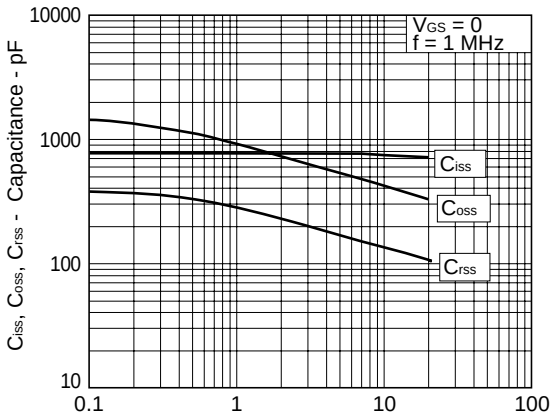




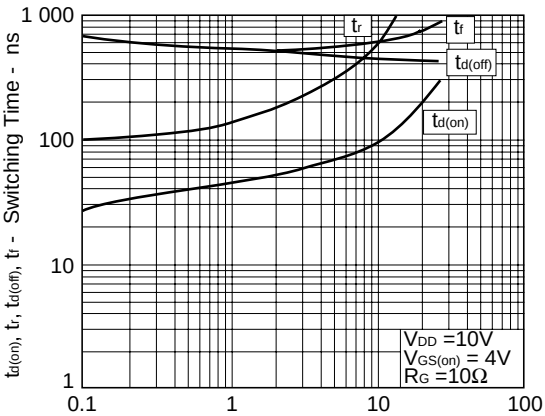

SOURCE TO DRAIN DIODE FORWARD VOLTAGE



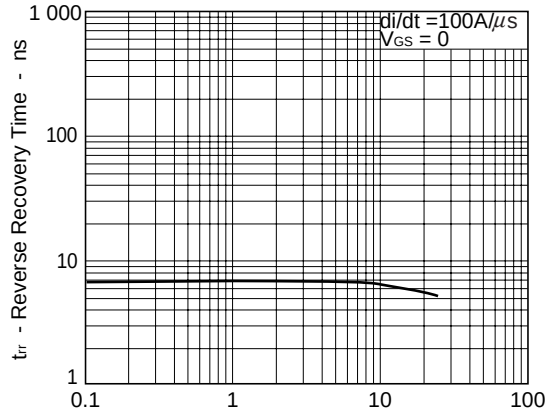

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



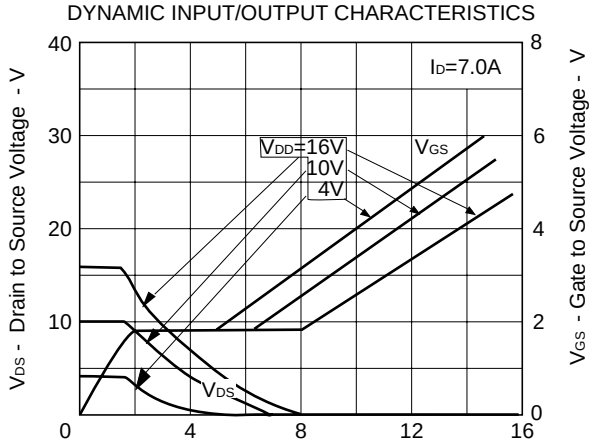

SWITCHING CHARACTERISTICS



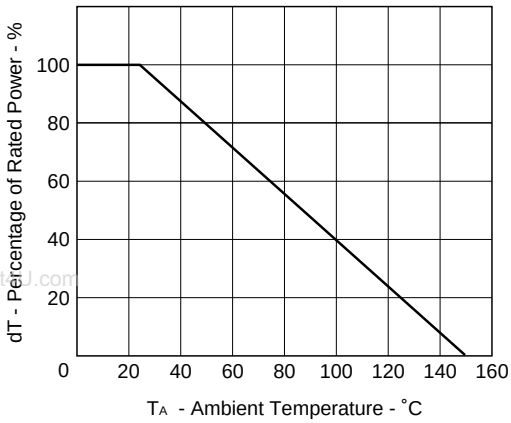

REVERSE RECOVERY TIME vs. DRAIN CURRENT



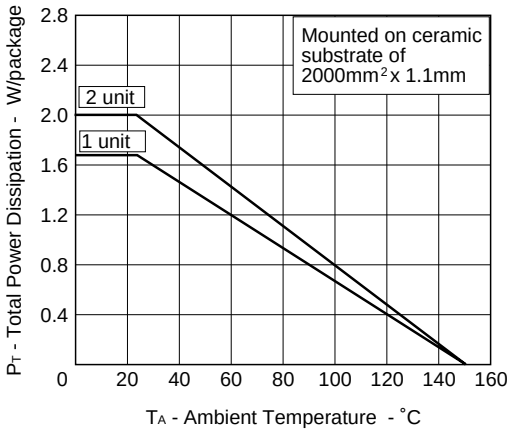

DYNAMIC INPUT/OUTPUT CHARACTERISTICS



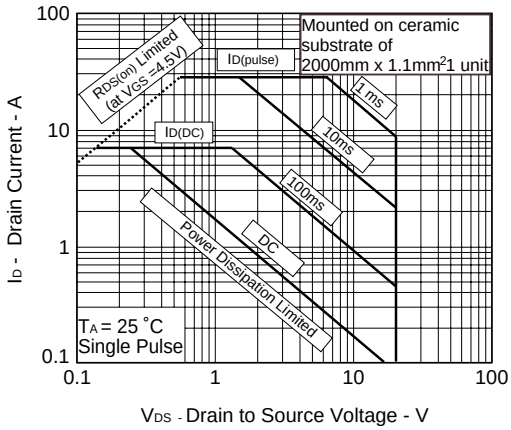
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



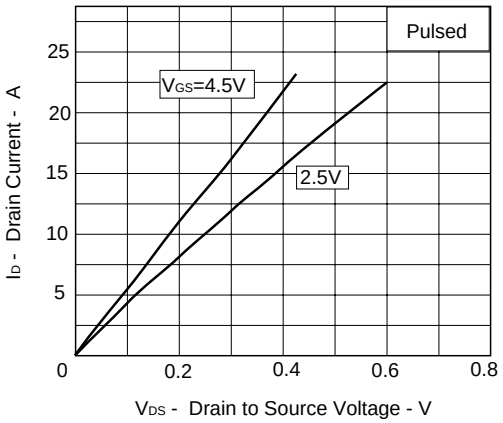

TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



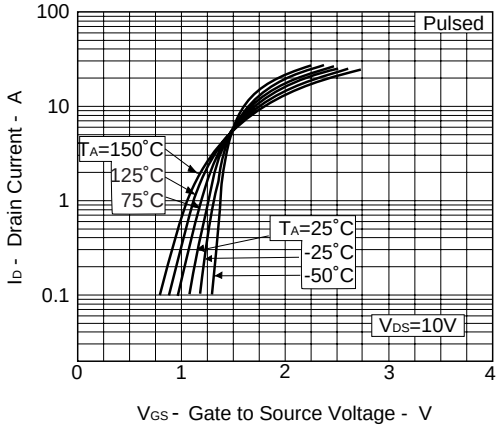

FORWARD BIAS SAFE OPERATING AREA




DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE




FORWARD TRANSFER CHARACTERISTICS



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Anti-radioactive design is not implemented in this product.

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